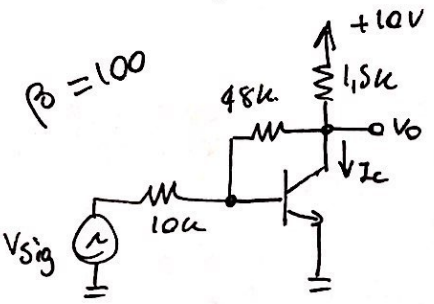
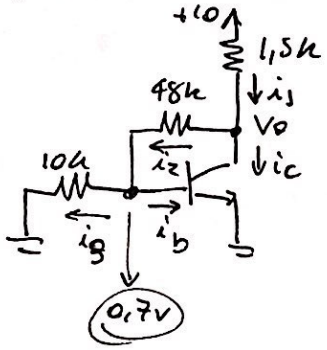
• Resolução Exercício I - CEA



a) calcular Vo e Ic

b) calcular $A_V = V_o / V_{sig}$

→ a) Fazer a análise c.c. :



LKC: $i_1 = i_c + i_2$; $i_2 = i_b + i_3$

$i_1 = \frac{10 - V_o}{1{,}5k}$

$i_2 = \frac{V_o - 0{,}7}{48k}$

$i_3 = \frac{0{,}7}{10k}$

$i_b = i_c / \beta$

• $i_c = i_1 - i_2$

$i_c = \beta(i_2 - i_3)$

• $i_1 - i_2 - \beta i_2 + \beta i_3 = 0$

$i_1 - (\beta+1) i_2 + \beta i_3 = 0$

$$\frac{10 - V_o}{1{,}5k} - \left[\frac{(\beta+1)V_o - (\beta+1)0{,}7}{48k}\right] + \frac{\beta \cdot 0{,}7}{10k} = 0$$

$$\frac{10}{1{,}5k} + 0{,}7\left[\frac{\beta+1}{48k} + \frac{\beta}{10k}\right] = V_o\left(\frac{1}{1{,}5k} + \frac{\beta+1}{48k}\right)$$

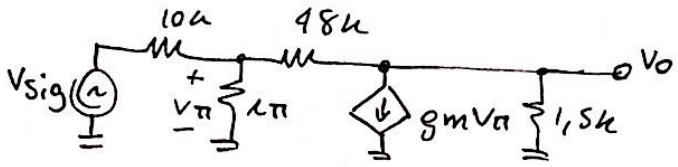
$$V_o = 360{,}9 \times \left[6{,}67\times10^{-3} + 8{,}473\times10^{-3}\right]$$

$$\boxed{V_o = 5{,}465\ V} \rightarrow I_c = \frac{10 - V_o}{1{,}5k} - \frac{V_o - 0{,}7}{48k} \Rightarrow \boxed{I_c = 2{,}924\ mA}$$

b) $g_m = \frac{2,924mA}{25mV} = 0,117\ A/V$

$r_\pi = \frac{V_T}{I_C} \cdot \beta = 855\Omega$

→ Fazendo a análise CA:



Nós: $\begin{cases} \frac{V_{sig} - V_\pi}{10k} = \frac{V_\pi}{r_\pi} + \frac{V_\pi - V_o}{48k} \\ \frac{V_\pi - V_o}{48k} = g_m V_\pi + \frac{V_o}{1,5k} \end{cases}$

• $\frac{V_\pi}{48k} - g_m V_\pi = V_o \left(\frac{1}{1,5k} + \frac{1}{48k}\right) \Longrightarrow \underline{V_o = -170,15 \cdot V_\pi}$

$\frac{V_{sig} - V_\pi}{10k} = \frac{V_\pi}{r_\pi} + \frac{V_\pi - (-170,15 V_\pi)}{48k}$

$V_\pi \left(\frac{1}{10k} + \frac{1}{r_\pi} + \frac{1 + 170,15}{48k}\right) = \frac{V_{sig}}{10k}$

$\underline{V_\pi = 0,021 \cdot V_{sig}} \longrightarrow A_V = -170,15 \cdot 0,021$

$\boxed{A_V = -3,57\ V/V}$